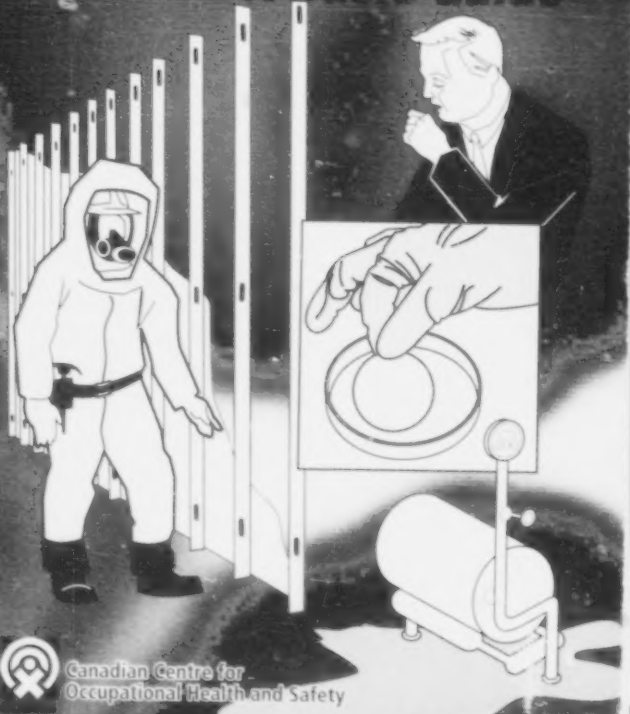
Mould in the Workplace

A Basic Guide



Canadian Centre for Occupational Health and Safety

Emergency Information

Ambulance

Fire

Police

Poison Control Centre

Doctor

Company Emergency Phone Number

Prepared by

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Mould in the Workplace: A Basic Guide

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Mould in the Workplace: A Basic Guide

Objectives

This guide will enable you to:

- recognize mould and the conditions which are favourable to its growth;
- identify jobs that can potentially pose a risk of harmful mould exposure;
- plan workplace mould surveys to identify mould problems;
- understand how to clean up mould;
- understand when mould measurement and analysis are needed;
- interpret information from mould measurement; and
- develop and implement a mould management and control program.

Scope

This guide provides basic information for recognizing mould, cleaning it up and preventing its growth.

This guide is written in plain, non-technical language. Extensive technical details of different types of mould and their biological mechanisms are beyond the scope of this guide. For a detailed technical evaluation of mould exposure and implementation of control measures, an occupational hygienist or other qualified professional with appropriate expertise should be consulted. For additional information please contact the Inquiries Service of the Canadian Centre for Occupational Health and Safety (CCOHS).

Target Audience

This guide is for workers, their supervisors, health and safety committee members, health and safety representatives, occupational health and safety professionals and others with an interest in recognition, evaluation and control of mould in the workplace. This guide will serve as handout in training sessions and safety meetings.

Summary

Mould is a fact of life. Moulds will grow practically everywhere people live and work. Mould is recognized as an occupational hazard for indoor workers as well as outdoor workers who work in warm and humid environments. All moulds are not harmful. However certain types of moulds can cause adverse health effects.

Occupational health and safety legislation does not specifically address adverse health effects of mould exposure. Mould growth within buildings is not acceptable and prompt remediation is necessary.

Mould contamination can affect building components such as walls, floor coverings, windows, ventilation systems, and support beams that are likely to be moist or water damaged. Mould may grow in warm and wet areas such as bathroom tubs, between tiles and window frames.

There have been reports linking health effects to mouldy surfaces in persons who worked in contaminated offices. Symptoms such as fatigue, respiratory ailments and eye irritation were typically experienced in these cases. All exposed people are not affected. Individuals with compromised immune systems are at the greatest risk.

In recent years potential adverse health effects of mould have caused widespread concern. Short-term effects of mould exposure include allergy-type symptoms such as runny nose, cough, and sore throats.

This guide provides an overview that will help you recognize, evaluate and control mould exposure in the workplace. Topics covered include: a description of moulds; health effects of mould; what to do when mould is found; how to interpret mould measurement data; how to clean up mould; and how to prevent mould growth.

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Introduction

The guide will provide an overview of mould related workplace issues and enable a reader to:

- recognize mould and the conditions which are favourable to its growth;
- understand how people might be effected by mould exposure;
- access guidelines and regulations;
- identify jobs that can potentially pose a risk of harmful mould exposure;
- plan workplace mould surveys;
- understand when mould measurement and analysis are needed;
- interpret information from mould measurement;
- understand how to clean up mould; and
- develop and implement a mould management and control program.

For many years, moulds have been recognized as potential health hazards in some specific workplaces. For example, workers in construction and demolition operations have become ill after exposure to dust containing mould. In recent years, there has been increasing concern about mould related health effects due to incidence of mould related complaints in:

- schools (specially in portable classrooms);
- residences for senior citizens; and
- office buildings with indoor air quality problems.

With increasing awareness of the potential health effects, concern about mould in the office environment has been growing. The significance of workplace mould in indoor air quality (IAQ) problems was realized by the discovery that mould spores can cause respiratory ailments such as congestion, runny nose and coughing. Skin and eye irritations have also been noted. People with pre-existing conditions such as asthma, hay fever, bronchitis and allergies seem particularly susceptible to mould exposure.

Section I

Types and Causes of Mould

1. What are Moulds?
2. Causes of Mould Growth
3. Types of Mould
4. How Moulds Grow
5. Where Moulds Grow

1. What are Moulds?

Moulds, mushrooms and yeast are three types of fungi. They are found everywhere indoors and outdoors and originate on plants and foodstuff. Everyone is familiar with moulds in our daily lives. Generally, we notice mould as:

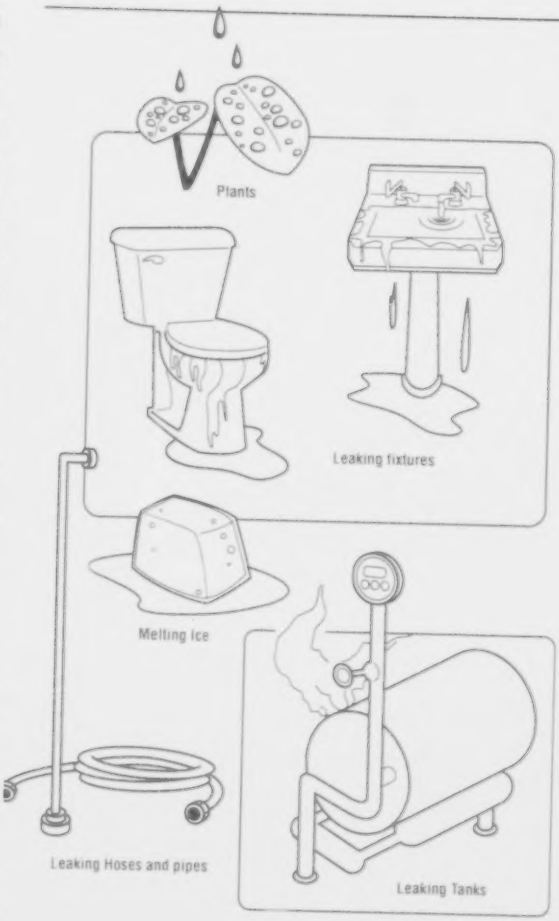
- fuzzy patches on the top of bread and other old food products;
- dark stains on paper or clothing which have been stored in damp places; and
- stains on rotted wood, paper, and other organic materials.

Moulds are important agents in nature. They break down and recycle organic materials. Moulds break down dead plants and other organic materials by producing enzymes which digest organic substances, using the digested materials for food to grow and multiply.

There are approximately 100,000 different types of mould. We are exposed to airborne mould on a daily basis in our homes, outdoors and at work. Some of most common moulds are described in the table on pages 5-9.

Not all moulds are harmful. Health effects experienced by exposed persons depend on:

- individual sensitivity;
- age;
- previous exposures; and/or
- existing predispositions.



There are many sources of water/moisture causing mould

2. Causes of Mould Growth

Mould needs two factors to flourish and grow – moisture and food (nutrient). Mould growth can start in any building where the following events have occurred:

- flooding,
- water leaks,
- inadequate air exchange,
- excess humidity, or
- condensation, especially in winter, on poorly insulated surfaces.

Sources of Indoor Moisture that Can Cause Mould Problems

- floods,
- backed-up sewers,
- leaky roofs,
- humidifier which is not regularly cleaned and disinfected,
- damp basements or crawl spaces,
- plumbing leaks,
- house plants and their debris,
- steam from cooking and showers, and
- wet clothes hung to dry indoors.

Mould can use a wide variety of material as food (nutrient). These can be organic materials such as wood, paper, leather, fabric, etc., or inorganic materials such as grout, painted walls, cement, plaster, etc., where moulds can get nutrients from dust and soil particles.

Since these materials are often part of the structures in which we work, we cannot effectively remove them to prevent mould growth. Our first line of defense against mould growth is to prevent excessive moisture and dampness.

3. Types of Mould

MOST COMMON TYPES OF MOULDS

Mould	Approx. Number of Species	Overview
Cladosporium	40	• *Cladosporium* is the most frequently found 'class' of fungi in outdoor air in temperate climates. • The spores easily become airborne and are transported over long distances. • The season for higher outdoor air concentrations is typically late summer and autumn and low season is typically winter and early spring. • It has been isolated from many different types of soil and is a major colonizer of plant waste (e.g., rotting leaves). • *Cladosporium* is everywhere and therefore sometimes problematic. • *Cladosporium* fungi sporulates heavily, and releases buoyant spores. This make this fungus an important fungal airway allergen, and together with *Alternaria* commonly causes asthma and hay fever. • It is found indoors as well, but in usually lower numbers, unless there is an indoor source of contamination.

MOST COMMON TYPES OF MOULDS

Mould	Approx. Number of Species	Overview
Cladosporium cont...	40	• Indoors this fungus is found in dirty refrigerators, especially in reservoirs where condensation is collected, and on moist window frames as a result of condensation. • *Cladosporium* often discolours interior paint, paper, and textiles stored under humid conditions. Houses with poor ventilation and houses located in damp environments may have heavy concentrations of *Cladosporium*.
Penicillium	200	• A wide number of organisms have been placed in this 'class'. • It is commonly found in carpet, wallpaper and in interior fiberglass duct insulation. • Many species of *Penicillium* are common contaminants on various substrates and are potential mycotoxin producers.
Aspergillus	200	• There are approximately 200 different species of *Aspergillus*, sixteen of which cause human disease. • These fungi are found in soil, compost piles, plant debris and stored grain, as well as on water damaged building materials.

MOST COMMON TYPES OF MOULDS

Mould	Approx. Number of Species	Overview
Aspergillus cont...	200	• *Aspergillus* species have been identified as causing potentially serious lung infections in hospital patients. • The diseases caused by these species rarely occur in individuals with normally functioning immune systems. • Toxin production is dependant on the species or a strain within a species and on the food source for the fungus.
Fusarium	50-70	• Most *Fusarium* species are soil fungi and have a world-wide distribution. • Found on a wide range of plants, some are pathogens that cause root and stem rot, vascular wilt or fruit rot. Other species cause storage rot. • Important mycotoxin producers. • Several species, notably *F. oxysporum, F. solani, and F. moniliforme*, are recognized as being pathogenic to man and animals causing skin and nail infections, especially in burn victims and bone marrow transplant patients. This fungus requires extremely wet conditions, and is often found in humidifiers.

MOST COMMON TYPES OF MOULDS

Mould	Approx. Number of Species	Overview
Trichoderma	20	• This fungus is easily recognized by its fast growing, quickly spreading white, green or yellow colonies. • It is one of the most widely spread soil fungi. • It colonizes dead leaves, fallen timber, compost heaps, and activated sludge. • With other fungi, *Trichoderma* species are highly aggressive. They have the ability to kill other fungi with their toxins and then consume them. • Because it readily degrades cellulose, it is often found in water or moisture damaged buildings.
Stachybotrys	15	• *Stachybotrys*, a dark coloured fungi, thrives on water damaged cellulose rich materials such as sheet rock, paper, ceiling tiles, cellulose containing insulation backing and wallpaper. • The presence of this fungus in buildings is significant because of the mould's ability to produce mycotoxins, which are extremely toxic.

MOST COMMON TYPES OF MOULDS

Mould	Approx. Number of Species	Overview
Stachybotrys cont...	15	• Exposure to these toxins can occur through inhalation, ingestion or dermal exposure • Exposure to *Stachybotrys* can cause dermatitis, cough, rhinitis, nose bleeds, a burning sensation in the mouth and nasal passage, cold and flu symptoms, headache, general malaise and fever.

4. How Moulds Grow

Most moulds grow as thread-like masses. Mould growths can often be seen in the form of discoloration, ranging from white to orange, green, brown, and black.

Moulds reproduce and spread by releasing tiny spores. The spores are extremely small and cannot be seen without using a microscope. The lightweight spores travel through the air, or are carried on dust particles, insects or animals.

When mould spores land on a damp spot with a suitable food supply, they may begin growing. It takes a few days for a mould colony to become established. If spills or leaks are cleaned up immediately, mould will normally not be a problem.

Cleaning up a spill

5. Where Moulds Grow

Moulds will grow wherever suitable conditions occur:

- a source of food,
- a source of moisture, and
- access to air (oxygen).

Moulds can live on many of the organic materials commonly found in buildings, such as:

- paper, wallpaper, fiberboard and dry wall;
- wood, including construction materials and furniture;
- fabrics (cotton, wool) and carpets;
- cellulose insulation and ceiling tiles;
- porous and foam insulation materials;
- fibre glass;
- paint; and
- discarded and spilled food products.

The critical requirement for mould growth is moisture. Moulds grow best under conditions of high humidity or in places where water accumulates.

Areas Which May Have High Mould Growth

Certain work areas frequently have mould problems because of high humidity, wet surfaces and/or use of water. These areas include:

- kitchens and food preparation areas;
- laundries;
- showers and washrooms;
- swimming pools;
- greenhouses and flower shops;
- shops selling used books and furniture;
- areas where paper, wood, carpet and construction materials are stored; and
- recycling plants.

Section II

Health Effects of Mould Exposure

1. Difficulties Linking Health Effects to Mould Exposure
2. Common Health Effects of Mould Exposure

1. Difficulties Linking Health Effects to Mould Exposure

Providing strong evidence of health effects from moulds in buildings is often quite difficult. There are several reasons for this.

1. The health effects which are commonly reported (irritation, cough, headache, fatigue, etc.) are non-specific and highly variable from person to person.
2. They can be caused by other conditions such as "flu", seasonal allergies to pollen, and chemicals in the workplace.
3. Mould contamination is frequently not visible in the work area. Mould may be growing in hidden wall cavities or ventilation systems.
4. Sampling for mould is difficult and costly.

Generally, moulds have clearly been identified as the cause of health problems when symptoms have been experienced by a number of people over prolonged periods, combined with direct evidence of extensive mould contamination or water damage.

Health Effects of Mould Exposure

2. Common Health Effects of Mould Exposure

The mere presence of mould does not mean that people will experience adverse health effects. For health effects to occur, high concentrations of mould and its spore must enter into the body. The most likely route of exposure in the workplace is by breathing in spores, or mould fragments which have been disturbed and have become air-borne. In many instances, mould is discovered without disturbing it or causing its spores to be distributed and no significant exposure takes place.

Modest mould exposure of the kind likely to be found in most workplaces will not affect the average healthy worker.

Generally, people who are usually at increased risk of ill health from mould exposure are:

- infants and children whose lungs may not be fully developed. The health risk in this group is from mycotoxins produced by the mould;
- people with allergies or other pre-existing health conditions, such as diabetes and asthma;
- people with reduced immune systems (such as organ transplant and chemotherapy patients);

Health effects associated with the presence of mould include (Ref. #18):

- runny or itchy nose,
- nasal congestion
- sore throat
- cough
- wheezing
- asthma symptoms in people sensitive to mould
- hypersensitivity pneumonitis in susceptible people*

*Hypersensitivity pneumonitis is a flu-like illness with cough and breathing problems. In some cases there are long term health effects. It is not associated with exposure to mould in an office-building environment. It is relatively rare and is associated with specific groups of workers. For example, farm workers who are exposed to mouldy hay may develop hypersensitivity pneumonitis (Farmer's Lung). It can also occur in demolition workers who can have prolonged exposure to high levels of airbourne dust which contains mould and other organic materials.

The following are reported health effects but there is insufficient evidence to associate them with the airborne dust which contains mould and other organic materials (Ref. #18).

- shortness of breath
- development of asthma
- fatigue
- skin symptoms
- chronic obstructive pulmonary disease
- lower respiratory illness in otherwise healthy adults
- gastrointestinal tract problems
- immune diseases
- reproductive effects

Long-term Consequences of Mould Exposure

There are no known long-term effects except in:

- sensitized persons;
- asthmatic persons; and
- persons with suppressed immune systems.

Healthy adults do not normally experience any permanent health problems resulting from exposure to moulds in contaminated buildings. The symptoms described above (runny nose, sore throat) disappear over a short time when exposure is reduced to background levels.

Some people develop a permanent sensitivity to moulds. They may develop symptoms at lower exposure levels which do not affect most other people. Sensitized people should avoid contaminated buildings and other mouldy environments.

The best established information on the long-term consequences of mould exposure have come from studies of farmers and demolition workers who have been massively exposed to airborne mould.

Section III

Mould Problems in the Workplace

1. Why Be Concerned About Mould?
2. Who Should Be Concerned About Mould?
3. Knowing if Your Workplace has a Mould Problem
4. Air Sampling and Laboratory Analysis
5. Employee Health Survey

1. Why Be Concerned About Mould?

We are concerned about mould because:

- some types of moulds produce spores that can cause adverse health effects; and
- in the workplace the most likely route of exposure is by breathing in air contaminated with mould spores or mould dust.

The mere presence of mould in a building does not cause health effects. For health effects to occur, the mould or its spores would need to be disturbed, become airborne and be inhaled in excessive amounts.

2. Who Should Be Concerned About Mould?

Everyone in the workplace has responsibility for health and safety. Therefore, everyone should be able to recognize mould and the conditions under which mould grows. This responsibility includes:

Workers – who must be able to recognize hazards and report to their supervisor/employer.

Managers and supervisors – who have legal responsibility to ensure a healthy and safe workplace ["duty-of-care" or the General Duty Clause in the Health and Safety Act].

Employers – who have legal responsibility to provide a healthy and safe workplace. [General Duty Clause, an essential section in most health and safety acts].

Members of the joint health and safety committee, and worker representatives – who have responsibility to recommend corrective action to protect employees from mould exposure.

Building Managers – who are responsible for the maintenance of the building and the heating, air conditioning and ventilation (HVAC) system.

The management and staff of construction companies need to be knowledgeable about mould and the consequences of mould exposure. Materials that are wet or have water damage can cause mould growth. Construction and remediation work, particularly in hospitals, has caused serious lung infections in patients.

3. Knowing if Your Workplace Has a Mould Problem

The Bioaerosols Committee of the American Conference of Governmental Industrial Hygienists (ACGIH) has developed guidelines for the assessment of bioaerosols [American Conference of Governmental Industrial Hygienists: Bioaerosols: Assessment and Control, Editor, Janet Macher, 1999]

Evaluation of bioaerosol exposure involves the following steps:

1. Visual inspection of the building (floor, ceiling, floor covering, etc.)
2. Assessment of occupant health symptoms.
3. Environmental monitoring.

Visual Inspection

Look for mould growth or potential for mould growth indicators such as:

Water stains: Water stains are very easily seen on ceiling tiles and on carpet. They are indications of past or current water damage. Not every water stain will have mould growth behind it but a water stain indicates need for further investigation.

Standing water: Standing water may be found in corners between the drywall and the tiled floor of hallways, when cleaning is done the water pools in the corner and soaks the drywall. Mould may grow on the wet drywall, especially behind the baseboards.

Condensation: Condensation takes place on cold water pipes and in the ventilation and air conditioning units. It can also occur in walls and ceilings.

Areas with poor air circulation: Lack of air movement may cause condensation. Suspected areas of mould growth are wall cavities where there is a damp wall.

Chances of mould growth are further increased if there is wallpaper that has not been properly pasted.

Heating ventilation and air conditioning systems: Look for mould in the condensation trays and heat exchanges coils. Humidification systems and wet porous insulation are potential mould growth sites.

Tips for a Visual Inspection

☑ LOOK for stains or patches which can be black, green, gray or brownish yellow. They are particularly noticeable on damp walls or areas where there has been flooding.

CHECK for the presence of a musty odour. When moulds are growing on fabric or carpets, there is often a musty odour in the area.

USE the simple test recommended by Canada Mortgage and Housing (1999)(Ref. #1) to test, patches and spots on walls for presence of mould.

Dab patches with a small amount of chlorine bleach. If the bleach changes the patch colour, or disappears, the stain is likely organic and probably mould.

LOOK for signs of water leakage such as patches on walls, floors, furniture and carpeting. Often small leaks or flooding may have gone undetected.

LIFT carpeting occasionally, raise ceiling tiles or peer behind duct work to see if mould growth has occurred. Mould also grows in "standing water."

CHECK humidifiers, dehumidifiers, drip trays, refrigerators, air conditioners, tubs and sinks. Floor drains which are not regularly flushed and sanitized can also grow mould. Any type of standing water will readily encourage "slime moulds."

If Mould Is Found: Next Steps

Once mould has been identified, it is usually best to clean it up as quickly and safely as possible. In workplaces where small or modest amounts of mould are discovered but employees are not showing ill health effects, it is not necessary to do any air sampling or laboratory analysis. An expert panel on fungal contamination indoors (Ontario Ministry of Health, July, 1999) did not recommend testing of mouldy material to determine the species present, unless there are medical, legal or community concern reasons to do so.

☑ ASSUME that presence of visible mould means that invisible mould spores are also present. Mould spores are extremely tiny (microscopic) particles which can be inhaled with breathing air.

CLEAN UP areas where mould has been identified.

PLAN clean up activities that eliminate (or minimize) the release of mould spores into the air.

USE proper personal protective equipment when cleaning up mould.

When flooding or water damage occurs, appropriate flood restoration procedures should be commenced as soon as possible. It is necessary to locate any hidden moisture behind walls and under carpets using a moisture meter.

Once mould has been identified, it is usually best to clean it up as quickly and safely as possible.

Sample

VISUAL MOULD INSPECTION CHECKLIST

Date: _____ **Location:** _____ **Inspected by:** _____ **and** _____

INSPECT	LOOK FOR	OBSERVATION Needs Further Action No	Yes	RECOMMENDATION(S)
Ventilation system	Damp filters/insulation	❑	❑	
	Damp conditions	❑	❑	
	Overall cleanliness	❑	❑	
Ceiling tiles, exposed insulated pipes	Signs of leak	❑	❑	
	Dampness	❑	❑	
	Unusual patches/stains	❑	❑	
Gypsum wallboard surfaces	Dampness	❑	❑	
	Unusual patches/soiling	❑	❑	
	Degraded wall surfaces	❑	❑	
	Mould under wall paper and wall coverings	❑	❑	

INSPECT	LOOK FOR	OBSERVATION Needs Further Action No	Yes	RECOMMENDATION(S)
Cardboard surfaces	Dampness/stains	❑	❑	
	Unusual patches	❑	❑	
Floors	Wet areas	❑	❑	
	Unusual patches	❑	❑	
	Mould growth under carpet	❑	❑	
Possible hidden mold behind the walls, ceilings and floors	Odours	❑	❑	
	Stains	❑	❑	
Potential for mold growth and continuing moisture penetration	Relative humidity greater than 60%	❑	❑	
	Condensation	❑	❑	

4. Air Sampling and Laboratory Analysis

Air sampling and laboratory analysis may be useful in situations where:

- employees are reporting allergies or other poor health symptoms;
- there is no obvious cause; and
- visual inspections have not detected mould.

Management should plan workplace monitoring in consultation with the joint health and safety committee.

A sampling strategy must be prepared including methodology for sample collection, analysis and interpretation of results.

Air monitoring may indicate the presence of fungal spores or mould particles. Such a finding necessitates a more thorough inspection of the building to locate the source of the mould. An occupational hygienist or other trained professional should carry out swipe or scrape samples to identify any toxin producing species.

The following sampling methods are used to assess mould contamination in a building:

Bulk sampling: Bulk samples are materials (e.g., settled dust, sections of wallboard, carpet pieces). The purpose of bulk sampling is to determine possible sources of mould contamination. Selected samples are sent to a laboratory for analysis.

Surface (tape, swab, contact slide) sampling: Surface samples provide information similar to bulk samples. Surface sampling is preferred over bulk samples when a less destructive method of sample collection is desired.

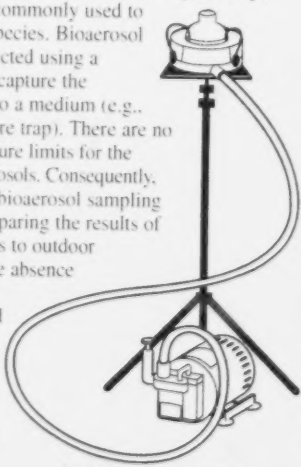
Surface tape lift samples can be effective as indicators of mould presence. Simply take celluloid tape or a commercially available sampling strip, put it over the mould and then remove it. Place it on a slide and send to a laboratory for microscopic analysis.

Surface sampling with sampling strip

Contact plate (contact slide) sampling involves pressing a solidified nutrient agar surface against the surface to be sampled. The plates are then sent to a laboratory for analysis. Contact slides are commercially available.

Taking swab samples is also easy. A sterilized Q-tip can be used to pick up samples to send for analysis.

Bioaerosol air sampling (culture plate, spore trap): Air sampling is commonly used to identify fungal species. Bioaerosol samples are collected using a suction pump to capture the contaminants onto a medium (e.g., culture plate, spore trap). There are no established exposure limits for the majority of bioaerosols. Consequently, interpretations of bioaerosol sampling are made by comparing the results of indoor air samples to outdoor air samples. In the absence of indoor mould sources, the mould concentration in the indoor air should be the same as that in the outdoor air.



Suction pump for air sampling

5. Employee Health Survey

A checklist or questionnaire (like the one on the following pages) is generally helpful in conducting an employee health survey.

The purpose of an employee health survey is to:

- gather information on the types of health problems that are experienced by building occupants;
- identify potential sources of such complaints;
- determine the possibility of a link between health problems and symptoms known to be associated with mould exposure;
- identify affected areas; and
- determine the need for a detailed investigation.

The format and language of the questionnaire should be simple so that individuals can complete it without assistance from the surveyors. Employee response to such health surveys must be kept strictly confidential.

Many of the symptoms experienced by people are similar when other IAQ factors such as ventilation and humidity are below minimum comfort criteria.

Sample

EMPLOYEE HEALTH SURVEY

Employee name _____ Department _____

Location _____ Information recieved by _____

Symptoms	Experienced at Work		Experienced at Home		Improves Over Weekend/Vacation		Possible Workplace-Related Causes
	Yes	No	Yes	No	Yes	No	
Nasal congestion	❑	❑	❑	❑	❑	❑	
Chronic colds	❑	❑	❑	❑	❑	❑	
Flu-like symptoms	❑	❑	❑	❑	❑	❑	
Nosebleeds	❑	❑	❑	❑	❑	❑	
Cough	❑	❑	❑	❑	❑	❑	
Wheezing	❑	❑	❑	❑	❑	❑	

Sample

Symptoms	Experienced at Work		Experienced at Home		Improves Over Weekend/Vacation		Possible Workplace-Related Causes
	Yes	No	Yes	No	Yes	No	
Breathing Difficulty	❑	❑	❑	❑	❑	❑	
Eye, nose, or throat irritation	❑	❑	❑	❑	❑	❑	
Headache	❑	❑	❑	❑	❑	❑	
Dizziness	❑	❑	❑	❑	❑	❑	
Fatigue	❑	❑	❑	❑	❑	❑	
Nausea, vomiting	❑	❑	❑	❑	❑	❑	
Rashes	❑	❑	❑	❑	❑	❑	
Fever, chills	❑	❑	❑	❑	❑	❑	
Muscle Aches	❑	❑	❑	❑	❑	❑	
Rapid Heartbeat	❑	❑	❑	❑	❑	❑	

Sample

Symptoms	Experienced at Work Yes	Experienced at Work No	Experienced at Home Yes	Experienced at Home No	Improves Over Weekend/Vacation Yes	Improves Over Weekend/Vacation No	Possible Causes
Symptoms occur:							
• Daily	❑	❑	❑	❑	❑	❑	_____
• Frequently	❑	❑	❑	❑	❑	❑	_____
• Occasionally	❑	❑	❑	❑	❑	❑	_____
Symptoms occur:							
• All day long	❑	❑	❑	❑	❑	❑	_____
• In the morning	❑	❑	❑	❑	❑	❑	_____
• In the afternoon	❑	❑	❑	❑	❑	❑	_____

Section IV

Dealing with Mould

1. If You Suspect Mould
2. When Mould is Found
3. Controlling and Mitigating Mould Growth
4. Tips for Mould Cleanup

1. If You Suspect Mould

If you experience health symptoms you think are caused by mould exposure, you should:

- ☑ REPORT it immediately to your supervisor.
- SEEK medical assistance. Tell the physician that you believe your symptoms are work-related.
- ASK your physician if you require medication, absence from work or accommodation as a result of this illness.
- INFORM your employer about the doctor's visit and indicate if you require accommodation or continued absence as a result of your illness.

2. When Mould is Found

☑ REPORT the finding(s) to your employer.

DOCUMENT the health issues. Mould occurs routinely indoors and outdoors and for the most part does not cause health problems. Although mould may be present on building materials, it does not necessarily mean that people will be exposed or exhibit health effects. In the workplace, mould spores must first become airborne and then be inhaled for exposure to happen.

ASSESS the workplace condition. An assessment involves a visual inspection and if necessary, testing. The inspection is to determine the extent of mould damage and the degree of clean-up and repair needed. Sampling and analysis help to determine the degree of the problem.

IDENTIFY and REMEDY root causes of mould growth. These steps are outlined in more detail by the following organizations that have developed special procedures for mould clean-up (see References – Appendix A5):

- Canada Mortgage and Housing Corporation (CMHC) (Ref. #1);
- New York City Department of Health (NYC-DOH) (Ref. #3);
- Health Canada (Ref. #4); and
- US EPA (Ref. #5).

CLEAN UP the mould. Cleaning up mould has four main phases:

- Properly train workers doing the clean up and provide them with protective equipment.
- Clean or remove contaminated materials, taking precautions to avoid spreading spores and dust to other areas.
- Decontaminate the heating ventilation and air conditioning (HVAC) systems if necessary.
- Repair and replace damaged materials such as wallboard, ceiling tiles or other structures.

The NYC-DOH procedure is included in Section VI of this document. The American Industrial Hygiene Association advises professional judgment be used to determine which practices best suit specific situations.

☑ COMMUNICATE with staff at all levels. It is vital and in everyone's interests to communicate clear and accurate information about the kind of mould problem, its scope and health risk, if any. As noted in a publication of the American Conference of Governmental Industrial Hygienists (ACGIH®Ref. #6):

> *"Good communication can improve understanding, allaying fears and lead to acceptance of the information offered... but poor communication can lead to confusion and distrust."*

You may use Appendices A1 and A2 of this Guide to educate employees.

Hazard communication during mould assessment and clean-up is an important aspect of mould management.

Employers have an obligation under the Occupational Health and Safety Act to provide a safe workplace, and therefore they must instruct workers in the safe handling and removal of mould contaminated material.

Building owners must ensure that any contractors follow proper clean-up procedures.

3. Controlling and Mitigating Mould Growth

Controlling moisture is the key to preventing indoor mould growth. The relative humidity of indoor environments should be maintained at 20–40% in winter and no more than 60% the rest of the year. Excessively dry air can also cause adverse health effects. If and when moisture problems develop, rapid and appropriate responses are important to prevent mould spores from germinating (see sources and strategies below). If wetness or spills are dried within 24–48 hours, mould growth is less likely to occur.

Eliminating Possible Sources of Excessive Moisture

Indoor sources

☑ FIX plumbing leaks, drips or "sweating" pipes.

LIMIT sources of indoor humidity/dehumidify indoor air.

IMPROVE air movement in poorly ventilated areas.

INCREASE fresh air ventilation when outdoor air is not humid.

INSULATE areas where dampness or condensation can occur.

WARM cold surfaces where condensation may occur.

Outdoor Sources

☑ MAINTAIN roof and gutter/downspout system.

DIRECT runoff away from foundation by grading, draintile, landscaping, etc.

USE air conditioning and keep building closed during high outdoor humidity.

PREVENT leakage around windows, doors, flashing, etc.

WATERPROOF foundations.

Section V

Interpretation of Mould Measurement Data

1. Comparing Mould Measurement Data with Standards

1. Comparing Mould Measurement Data with Standards

Airborne mould can be measured from a collected volume of air taken and analyzed using appropriate methodology.

Mould concentration in the air is measured as the number of colony forming units per cubic meter (CFU/m^3).

Several guidelines exist on the acceptable number of CFU/m^3 found in indoor air but they do not distinguish *safe* from *unsafe* levels. These guidelines include:

- The 2004 Threshold Limit Value (TLV) booklet, states that "there are no TLVs against which to compare environmental concentrations of most materials of biological origin."
- Researchers in the United States have suggested a 200 CFU/m^3 guideline for fungal bioaerosols based on the results from more than 2000 indoor and outdoor samples. The figure 200 CFU/m^3 was chosen because 75% of indoor samples yielded fungal concentration of less than 178 CFU/m^3. The authors also report a critical analysis of results is required if pathogenic or toxigenic moulds are detected (Ref. #7).
- Public Works Canada, using data collected since 1986 representing more than 6000 samples in hundreds of buildings, notes that indoor quantities of normal outdoor fungal species greater than 500 CFU/m^3 indicated poor filtration or housekeeping (Ref. #8).
- Canadian guidelines are published in Indoor Air Quality in Office Buildings: A Technical Guide (1995).(Ref. #9) The guideline notes the following:

  " If more than 50 CFU/m^3 of a single species other than Cladosporium or Alternaria are detected, there may be reason for concern.

Further investigation should be considered if a repeat sample confirms the finding and establishes that it is based on an indoor source."

"Up to 150 CFU/m^3 is acceptable if there is a mixture of species reflective of outdoor air spores. Higher counts suggest dirty air filters or other problems."

"Up to 500 CFU/m^3 is acceptable in summer if the species present are primarily *Cladosporium* or other tree or leaf fungi. Values higher than this may indicate failure of the filters or contamination in the building."

A basic common sense approach is to simply find out if there is more mould indoors than outdoors. If there is, then the workplace has a mould exposure problem.

For common workplace chemicals there are regulated limits for the concentrations allowable in workplace air. Such limits are generally given in the occupational health and safety regulations.

This is because research and experience with the chemicals has made us knowledgeable about the levels at which they effect health. This is not the case with moulds. Presently, we do not know what levels are safe.

The absence of this knowledge makes interpretation of results difficult. If the regulated threshold limit for a chemical was ten parts per million and we measured twenty parts per million in the workplace we would know immediately there was a problem. We cannot do this with mould since we do not know which levels are harmful and which are not. In the absence of regulated limits for mould, we can adopt the following approach to interpreting mould concentrations in the indoor air:

- No mould species found in indoor air should be present at significantly greater level than outdoors.
- Outdoor and indoor samples should have a similar rank order of species (Refer to Health Canada

website (http://www.hc-sc.gc.ca/hecs-sesc/air_quality/pdf/93ehd166.pdf) and ACGIH Guidelines for the Assessment of Bioaerosols in the Indoor Environment, 1989)

- A mould species which is found at a higher level indoors than outdoors is usually growing and reproducing inside the building.
- Air sampling which shows significantly higher indoor mould than outdoor mould must trigger further action in the form of rigorous investigation to locate the source of indoor mould growth.

Section VI

Mould Clean Up and Prevention

1. Why Clean Up Mould?
2. General Guidelines for Mould Clean Up
3. Mould Clean Up Methods
4. Knowing When the Mould Remediation or Clean Up is Finished

1. Why Clean Up Mould?

The purpose of cleaning up mould is to remove mould contamination. It is important to use proper work practices and isolation techniques to prevent spreading of spores or mould fragments.

Caution must be taken in removing and cleaning up the mould, particularly in buildings such as hospitals where patient exposure is a consideration.

Assess contamination – Mould contamination should always be assessed by an experienced Health and Safety professional, such as an Occupational Hygienist.

Train employees – Ensure that people who perform the clean up have adequate training and experience in handling environmental contamination. Specially trained maintenance staff can quite safely clean up small areas of contamination.

Use personal protective equipment including gloves, eye and respiratory protection. There are actually very few moulds that would produce enough poison (mycotoxins) to be harmful to humans in the average workplace. But it is possible that people cleaning up mould may have an allergic response or be exposed to high levels.

Caution

Moulds from bird and bat droppings are known to cause serious disease and special precautions must apply in these instances. The clean up work should be contracted to specialists.

Dispose of all the materials used to clean the mould in a sealed garbage bag. There is usually no need for special hazardous waste disposal.

2. General Guidelines for Mould Clean Up

- [x] IDENTIFY potentially mouldy areas that may need clean-up.

REMOVE mould by cleaning and disposing of contaminated material.

CLEAN non-porous materials with detergent and scrubbing.

IDENTIFY and eliminate the moisture source. Mould growth is a symptom of a problem. The actual problem is moisture intrusion or condensation. Until you correct the moisture problem, mould growth will continue.

INSPECT for a backed-up sewer, leaky roof, plumbing leaks, or condensation or leaks around windows and doors.

REPAIR the source area as needed. Mould spores are easily released when mouldy material is dried out, so clean up should begin immediately or as soon as repairs are completed.

WEAR rubber gloves, a respirator, eye protection and clothing that is easily cleaned or discarded.

OPEN windows during the clean up. Anyone not involved in the clean up should stay away from the areas being cleaned.

CONDUCT clean up after normal working hours.

REMOVE and dispose of porous materials that can trap moulds such as paper, ceiling tiles, carpet, rags, wallboard and rotten wood.

SPRAY all surfaces with a solution of 1 part bleach to 10 parts water. Never mix bleach with ammonia. Use a hand-held garden sprayer for large areas.

VENTILATE area well when using bleach.

SCRUB the entire area using a non-ammonia soap or detergent in hot water.

RINSE with clean water.

DISINFECT using bleach.

DRY thoroughly – keep in mind wet building materials require time to dry out completely. Fans and de-humidifiers may speed the process.

BAG and DISPOSE of any materials you are unable to completely clean.

REMOVE rinse water with wet/dry vacuum or by mopping.

ALLOW to dry.

DO NOT PAINT or CAULK over mould. Paint applied over mouldy surfaces is likely to peel.

In workplaces where employees are not experiencing health symptoms a regular visual check for moulds will usually be sufficient. Checking the workplace for mould growth can be part of the regular workplace health and safety inspection. People inspecting the workplace should be trained how to identify mould and recognize the conditions under which it grows.

Personal Protective Equipment (PPE) for Mould Cleanup

3. Mould Clean Up Methods

The following methods of clean up are based on an expert panel report known as "Guidelines on Assessment and Remediation of Fungi in Indoor Environments" (Ref. #3).

Other procedures for mould clean up exist. Professional judgment should be used to determine which are appropriate in a given situation.

Level I – Small Isolated Areas

(10 sq. ft or less)(1 m^2) - e.g., ceiling tiles, small areas on walls.

a. Remediation can be conducted by regular building maintenance staff. They should receive training on proper clean up methods, personal protection, and potential health hazards. This training can be performed as part of a program to comply with the requirements of the health and safety legislation.

b. Respiratory protection is recommended (e.g., N95 disposable respirator), in accordance with the OSHA respiratory protection standard (29 CFR 1910.134). The Canadian Standard CSA Z94.4-02, provides guidelines for the *Selection, Use and Care of Respirators*. Hand and eye protection should also be worn.

c. The work area should be unoccupied. Vacating people from spaces adjacent to the work area is not necessary but is recommended in the presence of infants (less than 12 months old), persons recovering from recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

d. Containment of the work area is not necessary. Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.

e. Contaminated materials that cannot be cleaned should be removed from the building in a sealed plastic bag. There are no special requirements for the disposal of mouldy materials.

f. The work area and areas used by remedial workers for egress should be cleaned with a damp cloth and/or mop and a detergent solution.

g. All areas should be left dry and visibly free from contamination and debris.

Level II – Mid-Sized Isolated Areas

(10–30 sq. ft.)(1–3 m²) - e.g., individual wallboard panels.

a. Remediation can be conducted by regular building maintenance staff. They should receive training on proper clean up methods, personal protection, and potential health hazards. This training can be performed as part of a program to comply with the requirements of the health and safety legislation.

b. Respiratory protection is recommended (e.g., N95 disposable respirator), in accordance with the OSHA respiratory protection standard (29 CFR 1910.134). The Canadian Standard CSA Z94.4-02, provides guidelines for the *Selection, Use and Care of Respirators*. Hand and eye protection should also be worn.

c. The work area should be unoccupied. Vacating people from spaces adjacent to the work area is not necessary but is recommended in the presence of infants (less than 12 months old), persons having undergone recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

d. The work area should be covered with a plastic sheet(s) and sealed with tape before remediation, to contain dust/debris.

e. Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.

f. Contaminated materials that cannot be cleaned should be removed from the building in sealed plastic bags. There are no special requirements for the disposal of mouldy materials.

g. The work area and areas used by remedial workers for egress should be HEPA vacuumed (a vacuum equipped with a High-Efficiency Particulate Air filter) and cleaned with a damp cloth and/or mop and a detergent solution.

h. All areas should be left dry and visibly free from contamination and debris.

Level III – Large Isolated Areas

(30–100 square feet)(3-10 m^2) - e.g., several wallboard panels

A health and safety professional with experience performing microbial investigations should be consulted prior to remediation activities to provide oversight for the project.

The following procedures at a minimum are recommended:

a. Personnel trained in the handling of hazardous materials and equipped with respiratory protection, (e.g., N95 disposable respirator), in accordance with the OSHA respiratory protection standard (29 CFR 1910.134). The Canadian Standard CSA Z94.4-02, provides guidelines for the *Selection, Use and Care of Respirators*. Hand and eye protection should also be worn.

b. The work area and areas directly adjacent should be covered with a plastic sheet(s) and taped before remediation, to contain dust/debris.

c. Seal ventilation ducts/grills in the work area and areas directly adjacent with plastic sheeting.

d. The work area and areas directly adjacent should be unoccupied. Further vacating of people from spaces near the work area is recommended in the presence of infants (less than 12 months old), persons having undergone recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

e. Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.

f. Contaminated materials that cannot be cleaned should be removed from the building in sealed plastic bags. There are no special requirements for the disposal of mouldy materials.

g. The work area and surrounding areas should be HEPA vacuumed and cleaned with a damp cloth and/or mop and a detergent solution.

h. All areas should be left dry and visibly free from contamination and debris.

The remediation procedures for Level IV are recommended if:

- the abatement procedures are expected to generate a lot of dust (e.g., abrasive cleaning of contaminated surfaces, demolition of plaster walls); and
- visible concentration of the fungi is heavy (blanket coverage as opposed to patchy).

Level IV – Extensive Contamination

(Greater than 100 contiguous sq. ft. in an area) (10 m²)

A health and safety professional with experience performing microbial investigations should be consulted prior to remediation activities to provide oversight for the project. The following procedures are recommended:

a. Personnel trained in the handling of hazardous materials equipped with:

   i. Full-face respirators with high efficiency particulate air (HEPA) cartridges.

   ii. Disposable protective clothing covering both head and shoes.

   iii. Gloves.

b. Containment of the affected area:

   i. Complete isolation of work area from occupied spaces using plastic sheeting sealed with duct tape (including ventilation ducts/grills, fixtures, and any other openings).

   ii. The use of an exhaust fan with a HEPA filter to generate negative pressurization.

   iii. Airlocks and decontamination room.

c. Vacating people from spaces adjacent to the work area is not necessary but is recommended in the presence of infants (less than 12 months old), persons having undergone recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (e.g., asthma, hypersensitivity pneumonitis, and severe allergies).

d. Contaminated materials that cannot be cleaned should be removed from the building in sealed plastic bags. The outside of the bags should be cleaned with a damp cloth and a detergent solution or HEPA vacuumed in the decontamination chamber

prior to their transport to uncontaminated areas of the building. There are no special requirements for the disposal of mouldy materials.

e. The contained area and decontamination room should be HEPA vacuumed and cleaned with a damp cloth and/or mop with a detergent solution and be visibly clean prior to the removal of isolation barriers.

f. Air monitoring should be conducted prior to occupancy to determine if the area is fit to reoccupy.

Level V – Remediation of HVAC Systems

V.1 A Small Isolated Area of Contamination (<10 sq. ft.) (<1 m²) in the HVAC System

a. Remediation can be conducted by regular building maintenance staff. They should receive training on proper clean up methods, personal protection, and potential health hazards. This training can be performed as part of a program to comply with the requirements of the health and safety legislation.

b. Respiratory protection is recommended (e.g., N95 disposable respirator),in accordance with the OSHA respiratory protection standard (29 CFR 1910.134). The Canadian Standard CSA Z94.4-02, provides guidelines for the *Selection, Use and Care of Respirators*. Gloves and eye protection should be worn.

c. The HVAC system should be shut down prior to any remedial activities.

d. The work area should be covered with a plastic sheet(s) and sealed with tape before remediation, to contain dust/debris.

e. Dust suppression methods, such as misting (not soaking) surfaces prior to remediation, are recommended.

f. Growth supporting materials that are contaminated, such as the paper on the insulation of interior lined ducts and filters, should be removed. Other contaminated materials that cannot be cleaned should be removed in sealed plastic bags. There are no special requirements for the disposal of mouldy materials.

g. The work area and areas immediately surrounding the work area should be HEPA vacuumed and cleaned with a damp cloth and/or mop and a detergent solution.

h. All areas should be left dry and visibly free from contamination and debris.

i. A variety of biocides are recommended by HVAC manufacturers for use with HVAC components, such as cooling coils and condensation pans. HVAC manufacturers should be consulted for the products they recommend for use in their systems.

VII Areas of Contamination (>10 sq. ft.) (>1 m^2) in the HVAC System

A health and safety professional with experience performing microbial investigations should be consulted prior to remediation activities to provide oversight for remediation projects involving more than a small isolated area in an HVAC system. The following procedures are recommended:

a. Personnel trained in the handling of hazardous materials equipped with:

   i. Respiratory protection is recommended (e.g., N95 disposable respirator), in accordance with the OSHA respiratory protection standard (29 CFR 1910.134). The Canadian Standard CSA Z94.4-02, provides guidelines for the *Selection, Use and Care of Respirators*.

   ii. Gloves and eye protection

   iii. Full-face respirators with HEPA cartridges and disposable protective clothing covering both

head and shoes should be worn if contamination is greater than 30 sq. ft. or 3 m^2.

b. The HVAC system should be shut down prior to any remedial activities.

c. Containment of the affected area:

   i. Complete isolation of work area from the other areas of the HVAC system using plastic sheeting sealed with duct tape.

   ii. The use of an exhaust fan with a HEPA filter to generate negative pressurization.

   iii. Airlocks and decontamination room if contamination is greater than 30 sq. ft. or 3 sq. metres.

d. Growth supporting materials that are contaminated, such as the paper on the insulation of interior lined ducts and filters, should be removed. Other contaminated materials that cannot be cleaned should be removed in sealed plastic bags. When a decontamination chamber is present, the outside of the bags should be cleaned with a damp cloth and a detergent solution or HEPA vacuumed prior to their transport to uncontaminated areas of the building. There are no special requirements for the disposal of mouldy materials.

e. The contained area and decontamination room should be HEPA vacuumed and cleaned with a damp cloth and/or mop and a detergent solution prior to the removal of isolation barriers.

f. All areas should be left dry and visibly free from contamination and debris.

g. Air monitoring should be conducted prior to re-occupancy with the HVAC system in operation to determine if the area(s) served by the system are fit to reoccupy.

h. A variety of biocides are recommended by HVAC manufacturers for use with HVAC components, such as cooling coils and condensation pans. HVAC manufacturers should be consulted for the products they recommend for use in their systems.

4. Knowing When the Mould Remediation or Clean Up is Finished

Make sure that:

- water or moisture problem is fixed;
- mould removal is complete;
- visible mould and mouldy odors are not present;
- there are no noticeable signs of water damage or mould growth; and
- people no longer report health complaints or physical symptoms.

Section VII

Water Damage

1. Water Quality
2. Cleaning Up Water Damage
3. The Water Clean Up Process

1. Water Quality

Water damage in workplace buildings can occur from three different categories of water: clean, gray and black. These categories refer to the source of the water, not its colour.

Clean water comes from water supply lines, steam leaks, sink overflows and broken toilet tanks, melting ice, snow and rainwater.

Gray water is water discharged from dishwashers or washing machines, some pits or from toilet overflows containing urine. The water carries bacteria, fungi, viruses and possibly parasites.

Black water originates from broken water drain traps, flooding from outdoor sources and sewage lines containing sewage. Water contaminated by human excreta, hospital waste, blood and so on is also classified as black water.

For further details refer to the website:

http://www.pwgsc.gc.ca/rps/aes/content/iaq_pub_remedial-e.html#2

Sources of Water Damage

2. Cleaning Up Water Damage

A wide variety of materials can be water damaged and may need to be cleaned. This includes furniture, carpets, textiles, books, files and papers, ceiling tiles, wall paneling, plaster, vinyl, hardwood floors, concrete floors, fiberglass, etc. The types of cleaning required for various water-damaged materials are summarized on the following pages.

General Guidelines for Cleaning Up Water Damage

☑ USE controlled conditions that prevent dispersion of any contaminants to other areas of the building.

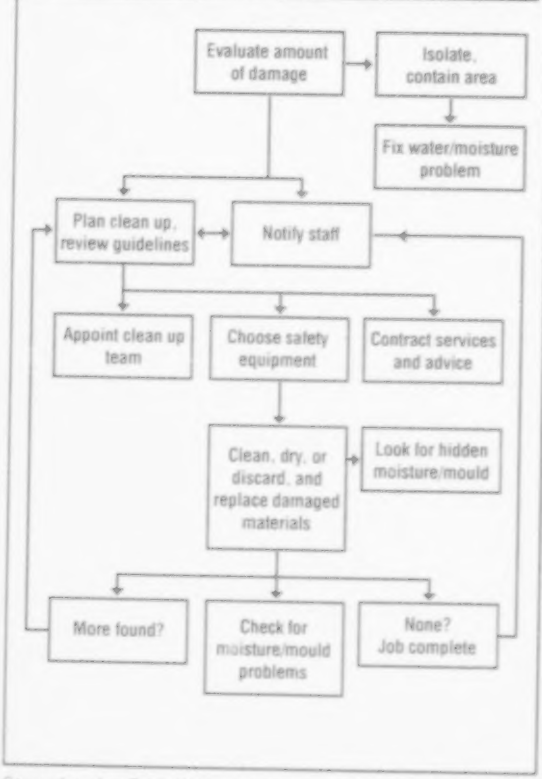
ISOLATE the area and use negative air pressure where the work is proceeding so that clean air from surrounding rooms is drawn towards the work area (rather than having debris and dust from the work area dispersed to other parts of the building).

REMOVE debris and wet materials with care, sealing them in bags and covered containers. Once outside the building discard these materials as normal construction waste. Clean all equipment used inside the "hot" zone before removal.

ASSUME a hazard unless it is proven that a hazard does not exist. Wear personal protective equipment: eye protection, gloves, boots, disposable coveralls and appropriate respiratory protection.

A flow chart showing the clean up process is shown on the following page.

WATER DAMAGE CLEAN-UP PROCESS



Source: based on Public Works and Government Services Canada (PWGSC) "Remedial Procedures for Water Damage" http://www.pwgsc.gc.ca/rps/aes/content/iaq_pub_remedial-e.html

CLEANING METHODS FOR VARIOUS WATER-DAMAGED MATERIALS

Material	Clean Water	Grey Water	Black Water
Coils	Pressure wash both sides		
Drains and Sumps	Clean, disinfect and flush		
Water pipes	Flush with bleach		
Air ducts	Inspect	Disassemble and decontaminate or replace	
Hard surfaces	Clean and dry	Clean with detergent or bleach and dry	
Furniture: Solid wood	Clean and dry	If odours persist after cleaning, discard	
Particle board, Laminates	Intact: clean and dry Damaged: discard	If saturated, discard	
Upholstered	Dry within 24 hours	Discard	

Material	Clean Water	Grey Water	Black Water
Carpets	Extract water, shampoo. Soak with bleach, rinse, dry, or steam clean dry.	Discard if area > 1m2. Area rugs can be sent out for cleaning --	
Under padding	Dry (removal of carpet may be necessary)	Discard	
Textiles	Laundry or dry clean		Dry clean or discard
Books, Files, Papers	Air or freeze dry*, vacuum		Photocopy, freeze dry*, vacuum
Fiberglass	Discard if wet or wetted		
Thermal/Acoustic lining	Clean	Discard	
Ceiling Tiles	If just a few tiles, dry them	Discard	

Material	Clean Water	Grey Water	Black Water
Drywall and Insulation	Remove saturated section and discard		
Plaster	Clean and dry	Disinfect small areas, remove if saturated or ordourous	
Wall Paneling	Clean and dry	Discard	
Concrete	Clean and dry	Clean with TSP**	
Vinyl and Hardwood Floors	Clean and dry. Inspect under mouldings and floor		
Sub-flooring Materials	Dry	Discard	

* Freeze drying is a special process that can be used to salvage important books or documents. Your local museum or library may be able to refer you to laboratories that 'freeze-dry' materials.

**TSP = Tri-sodium phosphate. TSP should be used with caution. Consult an MSDS for recommended safe use and handling procedures.

3. The Water Clean Up Process

It is critical to start the water damage clean up process within 24 hours of the damage occurring.

A water clean up program should follow the following clean up steps:

1. Inspect the water damaged area for safety hazards to ensure there is no potential for electric shock hazards, exposure to toxic gas or a confined space entry where there may be a possibility of oxygen depletion.
2. Conduct a safety inspection to check that structural components (walls, beams etc.) are secure and not about to collapse.
3. Provide appropriate respiratory protection to people doing clean up work for gray or black water damage. They must be equipped with appropriate respiratory protection. Ensure other protective equipment such as gloves, eye protection, protective suits and boots are worn.
4. Isolate the damaged area and put up warning signs and barriers. If necessary, move occupants away from the area.
5. Locate the source of the water leak; eliminate and repair it.
6. Remove equipment and/or furnishings and seal perimeter air handling units, exhaust systems and return air plenums.
7. Remove any excess water with mops, pumps, or wet vacuums.
8. Dry damaged materials using dehumidifiers, fans, and heaters, and by running the HVAC system to remove humid air.

Section VIII

Preventing Mould Growth

1. General Procedures for all Workplaces
2. Specific Measures for Construction in Hospitals

1. General Procedures for All Workplaces

The best way to prevent mould growth is to have a formal Mould Prevention Program in place. Such a program should be aimed at minimizing and eliminating the conditions that cause mould growth. Preventive measures include the following:

- ☑ INSTALL and USE exhaust fans vented to the outside in moist areas like kitchens, locker rooms, bathrooms, showers and clothes dryers. Where possible use a humidistat control on these fans.
- VENTILATE attic and crawl spaces to prevent moisture build-up. If crawl spaces are composed of bare earth, cover them with plastic.
- CONTROL humidity with air conditioners and/or dehumidifiers.
- KEEP air conditioners and/or dehumidifiers in good condition.
- EMPTY any water collectors regularly.
- EMPTY drip pans or water collectors regularly according to a schedule and protocol. For example, clean on a regular basis, brushing all surfaces with detergent and rinsing with diluted bleach.
- MAINTAIN the relative humidity levels below 60%. Check humidity levels regularly with an air quality monitor or datalogger.
- REDUCE the outdoor quantities of fungal spores entering the building by filtering the air supplied through the mechanical system.
- ENSURE that there are no wet insulation materials.
- REMOVE any pooled water within the central heating ventilation and air conditioning (HVAC) system and air handling system.
- AVOID lining any drip pans with porous insulation as this is ideal for breeding fungi.

USE specially designed filters in hospitals. Ideally the hospital air filtration system should have:

- a primary pleated fabric filter with a minimum efficiency of 30%; and
- secondary bay filters with 95 to 98% efficiency or even 99.97% (HEPA filters) for operating rooms.

CLEAN humidifiers regularly.

AVOID condensation on cold surfaces such as windows, sills, pipes and ducts. Ducts and pipes can be insulated to prevent condensation.

ELIMINATE the potential for wet and damp areas on walls, behind sinks, and so on. This can be achieved by the use of splash guards and removing carpets under drinking water fountains.

ENSURE there is a good maintenance procedure and good housekeeping for the air supply ducts, the return and exhaust systems and the mechanical system within the building.

KEEP a maintenance log and review it regularly.

CLEAN up any water damage due to flooding, spills, sewer back-ups or plumbing leaks. Sooner or later wet materials will become infected with fungi. The effective clean up of water damaged areas is a major proactive and preventive measure. A standardized water damage clean-up procedure should be used as detailed in Section IX – *Standards, Guidelines and Protocols for Mould*.

All aspects of a Mould Prevention Program should receive regularly scheduled evaluation to review housekeeping and engineering maintenance.

2. Specific Measures for Construction in Hospitals

Specific Measures for Hospitals

In addition to the general measures previously listed, hospitals should follow specific mould prevention guidelines during construction or renovation. These guidelines were developed by an expert committee at the US Centre for Disease Control and Prevention in Atlanta, Georgia (Ref. # 17).

1. The project site must be completely containedwith construction barriers extending from the floor, beyond the false ceiling, to the underside of the floor above.
2. The area should be vacuumed prior to beginning construction. All penetrations into the construction area must be sealed, windows closed, and air ducts capped.
3. Construction barricade entrances must have gasketed doors with self-closing latching hardware and dampened walk-off mats both inside and outside of the construction area.
4. Negative pressure must be maintained within the project site at all times by the use of negative air fan units fitted with high-efficiency particulate air (HEPA) filters.

   Alarms must be used so that any loss of negative pressure to the construction site can be known immediately.
5. Debris removal from the construction site must be completed by a predetermined route at times when patients are in their rooms with their doors closed. Debris should be transported in clean containers with tight-fitting covers.
6. Construction activities required in patient-occupied areas outside of the barricade must be regulated by a ceiling access procedure that requires a mini-enclosure around the work area.
7. Any dust tracked outside of the barrier must be removed immediately. Cleaning in patient occupied areas shall be done by damp wiping or with HEPA-filtered vacuum cleaners.
8. All air-handling ducts and return air plenums should be shut down or covered during all demolition activities.

Section IX

Standards, Guidelines and Protocols for Mould

1. Standards, Guidelines and Protocols for Mould

1. Standards, Guidelines and Protocols for Mould

Standards are technical specifications developed to ensure equipment, substances or procedures will do the intended task. Standards can be about composition of equipment or substance, performance, codes of practice and so on. Standards are often developed by professional and technical groups and are voluntary guidelines.

Standards which are regulations, voluntary guidelines or procedures for mould clean-up and prevention are summarized in the following table.

VOLUNTARY STANDARDS, GUIDELINES AND PROTOCOLS

Mould Management Guidelines

Expert panels have developed a number of procedures or protocols for mould management and clean-up. These procedures are voluntary guidelines. These guidelines are as follows:

- New York City Department of Health (Ref. #3)
- Health Canada (Ref. #4)
- American Conference of Governmental Industrial Hygienists (ACGIH) (Ref. #6)
- US Environmental Protection Agency (EPA) guideline directed at mould management in schools and commercial buildings (Ref. #5).
- Centres for Disease Control guideline developed for hospitals to prevent mould infection (Ref. #14)

Non-Industrial and Residential Home Guidelines	Canada Mortgage and Housing published several checklists and booklets to help homeowners managed mould problems. The Canada Building Code and the Canada Labour Code cite the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) standards for indoor air quality, including relative humidity (RH) levels which will prevent mould growth.
Guidelines for Health and Safety Professionals	Guidelines have been published by: • The American Industrial Hygiene Association (Ref. #13) • US National Institute for Occupational Health and Safety (Ref. #12) • American Conference of Governmental Industrial Hygienists (Ref. #6)
Exposure Limits	There are no legislated limits for exposure to moulds. Airborne levels are subject to interpretation as described in Section 9 and References (Refs. #6 – 9).

Section X

Occupational Health and Safety Legislation

1. Canadian Sources of Indoor Air Legislation
2. Canadian OH&S Legislation
3. US OH&S Legislation

1. Canadian Sources of Indoor Air Legislation

Legislation/Guidelines

Canada

Canada Occupational Health and Safety Regulations SOR/86-304, Division III HVAC Systems, Section 2.24 to 2.27.

British Columbia

Occupational Health and Safety Regulation B.C. Reg. 296/97, Indoor Air Quality – Section 4.70 to 4.80.

Manitoba

Guidelines for the Investigation, Assessment, and Remediation of Mould in Workplaces, March 2001.

New Brunswick

General Regulation – Occupational Health and Safety Act, N.B. Reg. 91-191, Part III Air Quality, Section 18 to 21.

Standards

CAN/CSA Z204-94
Guideline for Managing Indoor Air Quality in Office Buildings (entire standard).

CAN/CSA Z412-00
Guideline on Office Ergonomics.
Section 6.6 Thermal environment.
Section 6.7 Indoor air quality (IAQ).

Additional Document

Indoor Air Quality in Office Buildings: A Technical Guide (93-EHD-166). A Report of the Federal-Provincial Advisory Committee on Environmental and Occupational Health.

2. Canadian OH&S Legislation

The purpose of Occupational Health and Safety (OH&S) legislation is to protect you, the employee, against hazards on the job. It outlines the general rights and responsibilities of the employer, the supervisor and the employee.

The law makes both you and your employer jointly responsible for workplace health and safety legislation.

What Does the OH&S Legislation Say?

Each of the provinces and the federal government have their own OH&S legislation. The details of the OH&S legislation vary slightly from one jurisdiction to another but the basic elements are the same.

Most Canadian jurisdictions have a general duty provision in their OH&S legislation which requires employers to take all reasonable precautions to protect the health and safety of employees.

Government's Responsibilities

Government is responsible for ensuring compliance with health and safety legislation. Responsibilities of government include:

i) to develop and enforce occupational health and safety legislation regarding workplace inspections;

ii) to disseminate information;

iii) to promote training, education and research; and

iv) to take action in case of noncompliance.

Employee's Rights

i) to refuse unsafe work;

ii) to participate in workplace health and safety activities through the Joint Health and Safety Committee (JHSC) or an employee health and safety representative; and

iii) to know actual and potential dangers in the workplace.

Employee's Responsibilities

i) to work in compliance with the OH&S act and regulations;

ii) to use personal protective equipment and clothing as directed by the employer; and

iii) to report workplace hazards and dangers.

Supervisor's Responsibilities

i) to ensure that employees use prescribed protective equipment;

ii) to advise employees of potential and actual hazards; and

iii) to take every reasonable precaution in the circumstances for the protection of employees.

Employer's Responsibilities

i) to establish and maintain a Joint Health and Safety committee, or cause employees to select at least one health and safety representative;

ii) to take every reasonable precaution to ensure the workplace is safe;

iii) to inform employees about any potential hazards and provide training to work safely;

iv) to provide personal protective equipment and ensure workers know how to use the equipment safely and properly;

v) to immediately report all critical injuries to the government department responsible for OH&S; and

vi) to train all employees on how to safely use, handle, store and dispose of hazardous substances and to respond to emergencies.

Joint Health and Safety Committee (JHSC)

i) must be composed of management and employee representatives;

ii) at least half the members of the committee must be employee representatives;

iii) must meet at least once every 3 months (once a month in some jurisdictions);
iv) must be co-chaired by one management chairperson and one employee chairperson; and
v) employee representatives are elected or selected by the employees or their union.

Role of the Joint Health and Safety Committee

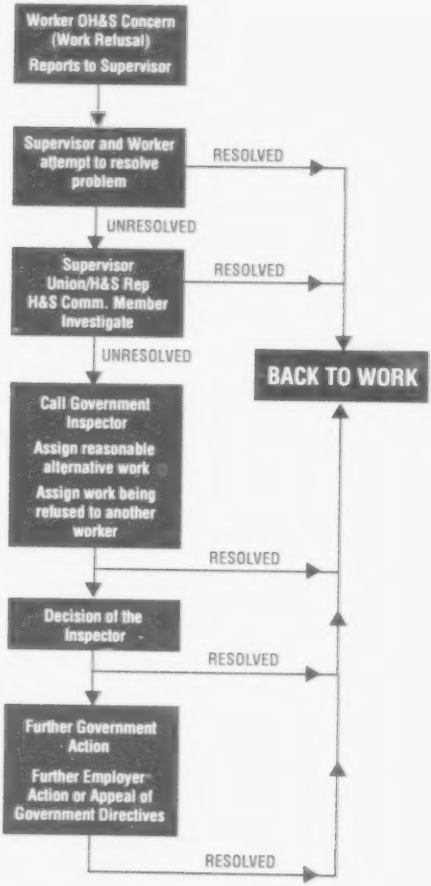
i) to act as an advisory body;
ii) to inspect the workplace approximately once a month;
iii) to identify hazards and obtain information;
iv) to recommend corrective actions;
v) to assist in resolving work refusal cases; and
vi) to participate in accident investigations and workplace inspections.

Work Refusals

You can refuse work if you have reason to believe that the situation is unsafe to either yourself or your co-workers.

i) You must report to your supervisor that you are refusing to work and state why you believe the situation is unsafe.
ii) You, your supervisor, and a JHSC member or employee representative will investigate.
iii) You return to work if the problem is resolved.
iv) If the problem is not resolved, a government occupational health and safety inspector is called.
v) Your supervisor may assign you reasonable alternative work.
vi) The inspector will investigate the situation and provide a decision to the employee and employer respresentatives.

Throughout the work refusal process, your employer is prohibited from disciplining you as long as you have reasonable cause to believe there is a danger, and have complied with the alternative work arrangements.



Work Refusal Flow Chart

Right to Refuse Work

An employee may refuse to perform work if the employee has reason to believe that the performance of that work may cause danger to the employee or to another employee. An employee may not exercise the right to refuse, if :

- The refusal puts the life, health or safety of another person directly in danger; and
- The danger is a normal condition of employment.

Examples of employees in this category are police, fire fighters, health care workers and ambulance drivers.

The employee must report the reason for work refusal to his/her supervisor without delay. The employee and the supervisor try to resolve the work refusal themselves, as soon as possible.

If the employee and his/her supervisor fail to resolve the matter they must follow the resolution process stated in the health and safety act. The specific resolution process may vary from one jurisdiction to another. Following are the basic elements of work refusal resolution process

Step 1

The supervisor investigates the situation in the presence of the worker and one of the following:

a) worker member of the health and safety committee;

b) health and safety representative; or

c) worker selected by a trade union or workers to represent them.

If the situation is resolved the worker resumes work.

Step 2

In case of non-resolution at Step 1, the employee or the employer notified a government inspector of the continual work refusal for the purpose of an official government investigation.

Pending the investigation and decision of the inspector the supervisor may:

- Assign the worker reasonable alternative work;
- Assign the work being refused to another worker provided that worker is advised about the work refusal and the reasons for the work refusal.

Step 3

The government inspector provides a written decision and/or directions after his/her investigation.

Step 4

An employer, worker or trade union may appeal the inspector's decision following the procedures specified in the occupational health and safety act.

Step 5

The work refusal may continue until the appeal process is completed.

Reprisals by employer prohibited

An employer cannot take disciplinary action against an employee for exercising his/her rights :

1. To report conditions or practices which may pose risk to the health and safety of the employee or other employees
2. To refuse dangerous work.

Work Stoppage

Work stoppage legislation applies to Ontario only. Certified members of the Joint Health and Safety Committee may direct the employer to stop work if
all of the following three conditions exist:

i) Health and safety legislation is being violated.

ii) The violation poses a danger or a hazard to employees.

iii) Any delay in controlling the danger or hazard may seriously endanger an employee.

Ask your Joint Health and Safety Committee for detailed procedures for work stoppage.

3. U.S. Occupational Health and Safety Legislation

In the United States of America (USA) the Occupational Safety and Health Act is popularly known as the OSH Act. The Occupational Safety and Health Administration (OSHA) is responsible for administering the OSH Act.

The OSH Act does not cover the following four categories of people:

- self-employed persons;
- farms which employ only immediate family members of the farm employer;
- workers covered by other legislation; and
- state and local government employees.

Regulations dealing with OSHA are published in Title 29 of the Code of Federal Regulations as:

- 29 CFR Part 1910 Occupational Safety and Health Standards, and
- 29 CFR Part 1926 Construction Standards.

These standards define exposure limits, exposure monitoring methods, medical surveillance and protective measures.

Duties of Employer

The OSH Act sets out two main duties for employers:

- Employers must provide a workplace which is free from hazards that are known to cause or likely to cause death or serious physical harm to employees.
- Employers must comply with occupational safety and health standards under the Act.

Duties of Employees

Employees must comply with occupational safety and health standards, rules, regulations and orders which are applicable to their own conduct and actions.

Key Provisions

Some Key Provisions of the OSH Act:

- To assure, insofar as possible, that every employee has safe and healthy working conditions.
- To require employers to maintain accurate records of exposures to potentially toxic materials or harmful physical agents and inform employees of the monitoring results.
- To allow at least one employee representative to be present during the walkaround inspection.
- To encourage free and open exchange of information between employees and the inspector.
- To implement procedures for investigating alleged violations, at the request of any employee or employee representatives, issuing citations and assessing monetary penalties against employers.

Section XI

Information Sources

1. Canadian Government Departments with Responsibility for Occupational Health and Safety
2. US Federal Safety and Health Agencies
3. State Occupational Safety and Health Plans

1. Canadian Government Departments Responsible for Occupational Health and Safety

Canadian Centre for Occupational Health and Safety (CCOHS)

Client Services
Phone: 905-570-8094
Toll-free: 1-800-668-4284 (Canada and US only)
Fax: 905-572-2206
E-mail: clientservices@ccohs.ca
Web Site: www.ccohs.ca

Inquiries Service
(FREE answers to your OH&S questions)
Phone: 905-572-4400
Toll-free: 1-800-263-8466 (Canada only)
Fax: 905-572-4500
E-mail: inquiries@ccohs.ca
OSH Answers Web Site: www.ccohs.ca/oshanswers

Federal Jurisdiction

Labour and Workplace Information
Human Resources and Skills Development Canada
Ottawa ON K1A 0J2
Web Site: www.hrsdc.gc.ca/en/gateways/business/menu.shtml#labour

Regional and District Offices:
Web Site: www.hrsdc.gc.ca/en/gateways/nav/top_nav/contact_us_r.shtml

Provincial Jurisdictions

Alberta

Workplace Health and Safety
Alberta Human Resources and Employment
9940-106 Street
Edmonton, AB T5K 2N2
General Inquiries: (780) 415-8690
Toll-free: 1-866-415-8690
Fax: (780) 422-3730
E-mail: whs@gov.ab.ca
Web Site: www.gov.ab.ca/hre/whs/

British Columbia

Workers' Compensation Board of British Columbia
6951 Westminster Highway (Richmond, BC)
PO Box 5350 Stn Terminal
Vancouver, BC V6B 5L5

Workplace Safety and Health Inquiries
Phone: (604) 276-3100
Toll-free in B.C.: 1-888-621-7233 (SAFE)

Health and Safety Emergency Accident Reporting
Toll-free in B.C.: 1-888-621-7233 (SAFE)
After hours: 1-866-922-4357
Web Site: www.worksafebc.com

Manitoba

Workplace Safety and Health Division
Manitoba Labour and Immigration
200-401 York Avenue
Winnipeg, MB R3C 0P8
General Inquiries: (204) 945-3446
Toll free in Manitoba: 1-800-282-8069
After hours: (204) 945-0581
Fax: (204) 945-4556
Web Site: www.gov.mb.ca/labour/safety/

New Brunswick

Workplace Health, Safety and Compensation Commission of New Brunswick

1 Portland Street
PO Box 160
Saint John, NB E2L 3X9
General Inquiries: (506) 632-2200
Toll-free in NB: 1-800-442-9776
Toll-free in PEI, NL, QB, ON: 1-800-222-9775
E-mail: prevention@whsccnb.ca
Fax: (506) 453-7982
Web Site: www.whscc.nb.ca/

Newfoundland and Labrador

Department of Labour

Confederation Building, 4th Floor, West Block
PO Box 8700
St. John's, NL A1B 4J6
General Inquiries: (709) 729-7420
Toll-free in NL: 1-800-563-5471
Fax: (709) 729-3445
Web Site: www.gov.nf.ca/labour/

Northwest Territories and Nunavut

Workers' Compensation Board of Northwest Territories and Nunavut

PO Box 8888
Yellowknife, NT X1A 2R3
General Inquiries: (867) 920-3888
Toll free: 1-800-661-0792
Fax: (867) 873-4596
E-mail: yellowknife@wcb.nt.ca
Web Site: www.wcb.nt.ca

Iqaluit

PO Box 669
Iqaluit, NU X0A 0H0
Phone: (867) 979-8500
Fax: (867) 979-8501
Toll-free: 1-800-877-404-4407
E-mail: iqaluit@wcb.nt.ca

Nova Scotia

Nova Scotia Department of Environment and Labour
Occupational Health and Safety Division
5151 Terminal Rd., 6th Floor
PO Box 697
Halifax, NS B3J 2T8
General Inquiries: (902) 424-5400
Toll free in NS: 1-800-952-2687
Fax: (902) 424-5640
E-mail: labrohs@gov.ns.ca
Web Site: http://www.gov.ns.ca/enla/ohs/

Ontario

Ministry of Labour
Occupational Health and Safety Branch
655 Bay Street, 14th Floor
Toronto, ON M7A 1T7
General Inquiries: (416) 326-7770
Toll free in Ontario: 1-800-268-8013
Fax: 416-326-7761
E-mail: webohs@mol.gov.on.ca
Web Site: www.gov.on.ca/lab/ohs

Prince Edward Island

Workers' Compensation Board of PEI
Occupational Health and Safety Division
PO Box 757, 14 Weymouth Street
Charlottetown, PE C1A 7L7
General Inquiries: (902) 368-5680
Toll-free in PEI: 1-800-237-5049
Fax: (902) 368-5696
Web Site: www.wcb.pe.ca

Québec

Commission de la santé et de la sécurité du travail du Québec (CSST) (Occupational Health & Safety Commission)

CP 6056, Succursale Centre-ville
Montréal, PQ H3C 4E1
Phone: (514) 906-3060
Toll-free in PQ: 1-800-667-7585
Fax: (514) 906-3062
Web Site: www.csst.qc.ca

Saskatchewan

Saskatchewan Labour
Occupational Health and Safety Division

1870 Albert Street
Regina, SK S4P 3V7
Toll-free in SK: 1-800-567-7233
Fax: (306) 787-2208
E-mail: webmaster@lab.gov.sk.ca
Web Site: www.labour.gov.sk.ca/

Saskatoon Office:
Phone: (306) 933-5042
Toll-free: 1-800-667-5023
Fax: (306) 933-7339

Yukon Territory

Yukon Workers' Compensation Health and Safety Board

401 Strickland Street
Whitehorse, YT Y1A 5N8
General Inquiries: (867) 667-5645
24-hour Emergency Line for Reporting Serious Workplace Accidents and Injuries: (867) 667-5450
Toll-free across Canada: 1-800-661-0443
Fax: (867) 393-6279
E-mail: worksafe@gov.yk.ca
Web Site: www.wcb.yk.ca

For an up-to-date listing of information sources visit *http://www.ccohs.ca/oshanswers/information/govt.html*

3. US Federal Safety and Health Agencies

US Environmental Protection Agency (EPA)

Ariel Rios Building
1200 Pennsylvania Avenue NW,
Mail Code 3213A
Washington, DC 20460
Phone: (202) 272-0167
Web Site: www.epa.gov

National Institute for Occupational Safety and Health (NIOSH)

4676 Columbia Parkway, Mail Stop C-13
Cincinnati, OH 45226-1998
Toll-free in the US: 1-800-35-NIOSH
(1-800-356-4674)
Outside the US: (513) 533-8328
E-mail: eidtechinfo@cdc.gov
Web Site: www.cdc.gov/NIOSH/homepage.html

Occupational Safety & Health Administration (OSHA)

200 Constitution Ave., NW
Washington, DC 20210
Phone: (202) 693-2000
Toll free Emergency Reporting: 1-800-321-OSHA (6742)
Web Site: www.osha.gov

A listing of the Regional Offices follows:

OSHA Regional Offices

Region 1: Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont, US Dept. of Labor – OSHA

JFK Federal Building, Room E340
Boston, MA 02203
Phone: (617) 565-9860
Fax: (617) 565-9827
Web Site: www.osha.gov/oshdir/r01.html

Region 2: New Jersey, New York, and Puerto Rico, Virgin Islands, USA Dept. of Labor – OSHA

201 Varick St., Rm. 670
New York, NY 10014
Phone: (212) 337-2378
Fax: (212) 337-2371
Web Site: www.osha.gov/oshdir/r02.html

Region 3: District of Columbia, Delaware, Maryland, Pennsylvania, Virginia and West Virginia, USA Dept. of Labor – OSHA

The Curtis Center, Suite 740 West
170 S. Independence Mall West
Philadelphia, PA 19106-3309
Phone: (215) 861-4900
Fax: (215) 861-4904
Web Site: www.osha.gov/oshdir/r03.html

Region 4: Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee, USA Dept. of Labor – OSHA

61 Forsyth St. SW
Atlanta, Georgia 30303
Phone: (404) 562-2300
Fax: (404) 562-2295
Web Site: www.osha.vog/oshdir/r04.html

Region 5: Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin, USA Dept. of Labor – OSHA

230 South Dearborn St., Rm. 3244
Chicago, IL 60604
Phone: (312) 353-2220
Fax: (312) 353-7774
Web Site: www.osha.gov/oshdir/r05.html

Region 6: Arkansas, Louisiana, New Mexico, Oklahoma, and Texas, USA Dept. of Labor – OSHA

525 Griffin St., Rm. 602
Dallas, TX 75202
Phone: (214) 767-4731
Fax: (214) 767-4693
Web Site: www.osha.gov/oshdir/r06.html

Region 7: Iowa, Kansas, Missouri, and Nebraska, USA Dept. of Labor – OSHA

City Center Square
1100 Main St., Suite 800
Kansas City, MO 64105
Phone: (816) 426-5861
Fax: (816) 426-2750
Web Site: www.osha.gov/oshdir/r07.html

Region 8: Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming, USA Dept. of Labor – OSHA

1999 Broadway, Suite 1690
PO Box 46550
Denver, CO 80202-6550
Phone: (303) 844-1600
Fax: (303) 844-1616
Web Site: www.osha.gov/oshdir/r08.html

Region 9: Samoa, Arizona, California, Guam, Hawaii, Nevada, and Trust Territory of the Pacific Islands, USA Dept. of Labor – OSHA

71 Stevenson Street St.
4th Floor, Suite 420
San Francisco, CA 94105
Phone: (415) 975-4310
Fax: (415) 975-4319
Web Site: www.osha.gov/oshdir/r09.html

Region 10: Alaska, Idaho, Oregon, Washington, USA Dept. of Labor – OSHA

1111 Third Avenue, Suite 715
Seattle, Washington 98101-3212
Phone: (206) 553-5930
Fax: (206) 553-6499
Web Site: www.osha.gov/oshdir/r10.html

State Occupational Safety and Health Plans

Alaska

Alaska Department of Labor and Workforce Development
P.O. Box 21149
Juneau, Alaska 99801-1149
Physical location:
1111 W. 8th Street, Room 304
Juneau, Alaska 99801-1149
Phone: (907) 269-4955
Toll-free: 1-800-770-4940
Fax: (907) 269-4950
Web Site: www.labor.state.ak.us/lss/oshhome.htm

Arizona

Industrial Commission of Arizona
800 W. Washington
Phoenix, Arizona 85007-2922
Phone: (602) 542-5795
Fax: (602) 542-1614
Web Site: www.ica.state.az.us/ADOSH/oshatop.htm

California

California Department of Industrial Relations
455 Golden Gate Avenue - 10th Floor
San Francisco, California 94102
Phone: (415) 703-5050
toll-free: 1-800-963-9424
Fax: (415) 703-5114
Web Site: www.dir.ca.gov/occupational_safety.html

Connecticut

Connecticut Department of Labor
Consultation Services
Division of Occupational Safety and Health
38 Wolcott Hill Road
Wethersfield, Connecticut 06109
Phone: (860) 566-4550
Fax: (860) 566-6916
Web Site: www.ctdol.state.ct.us/osha/osha.htm

Hawaii

Hawaii Department of Labor and Industrial Relations
Consultation and Training Branch
830 Punchbowl Street, Room 423
Honolulu, Hawaii 96813
Phone: (808) 586-9100
Fax: (808) 586-9104
Web Site: www.hiosh.hawaii.gov

Indiana

Indiana Department of Labor
Indiana Government Center – South
402 W. Washington Sreet, Room W195
Indianapolis, Indiana 46204
Phone: (317) 232-2655
Fax: (317) 232-3790
Web Site: www.in.gov/labor/iosha

Iowa

Iowa Division of Labor Services
Occupational Safety and Health
1000 E. Grand Avenue
Des Moines, Iowa 50319-0209
Phone:(515) 281-7629 Consultation
Phone:(515) 281-0202 Education
Fax: (515) 281-5522
Web Site: www.state.ia.us/iwd/labor/index.html

Kentucky

Kentucky Labor Cabinet
1047 U.S. Highway 127 South, Suite 4
Frankfort, Kentucky 40601

OSH Division of Compliance
Phone: (502) 564-3070 ext. 266
Fax: (502) 564-4769

OSH Division of Education and Training
Phone: (502) 564-3070
Fax: (502) 564-4769
Web Site: www.labor.ky.gov/osh/index.htm

Maryland

Maryland Department of Labor, Licensing and Regulation
1100 North Eutaw Street, Room 613
Baltimore, Maryland 21201-2206
Maryland Occupational Safety & Health (MOSH)
Phone: (410) 767-2215
Fax: (410) 333-7747
Web Site: www.dllr.state.md.us/labor/mosh.html

Michigan

Michigan Department of Consumer and Industry Services, Bureau of Safety and Regulation
7150 Harris Drive
P.O. Box 30643
Lansing, Michigan 48909-8143
Phone: (517) 322-1814
Fax: (517) 322-1775
Web Site: www.michigan.gov/cis/0,1607,7-154-11407---,00.html

Minnesota

Minnesota Department of Labor and Industry
443 Lafayette Road North
St. Paul, Minnesota 55155-4311
Phone: (651) 284-5060
Fax: (651) 284-5781
Web Site: www.doli.state.mn.us/wsc.html

Nevada

Nevada Division of Industrial Relations Occupational Safety and Health Enforcement
1301 N. Green Valley Parkway – Suite 200
Henderson, Nevada 89014
Phone: (702) 486-9020
Fax: (702) 990-0360
Web Site: dirweb.state.nv.us

New Jersey

New Jersey Department of Labor
Labor Standards and Safety Enforcement
Safety and Health
225 E. State Street
8th Floor West
P.O. Box 953
Trenton, New Jersey 08625-0953
Phone: (609) 292-3923
Fax: (609) 292-4409
Web Site: www.state.nj.us/labor/lsse/lspeosh.html

New Mexico

New Mexico Environment Department
Occupational Health and Safety Bureau
525 Camino de Los Marquez, Suite 3
PO Box 26110
Santa Fe, New Mexico 87502
Phone: (505) 827-4230
Fax: (505) 827-4422
Web Site: www.nmenv.state.nm.us/OHSB_website/ohs/_home.htm

New York

New York Department of Labor
Workplace Safety & Loss Prevention Program
Room 167 Bldg. 12 State Campus
Albany, New York 12240W
Phone: (518) 457-1125
Fax: (518) 485-1167
Web Site: www.labor.state.ny.us/business_ny/employer_responsibilities/protecting_workforce.html

North Carolina

North Carolina Department of Labor
4 West Edenton Street
Raleigh, North Carolina 27601
Bureau of Consultative Services
Phone: (919) 807-2796
Fax: (919) 807-2902
Web Site: www.nclabor.com/osha/osh.html

Oregon

Oregon Occupational Safety and Health Division
Department of Consumer & Business Services
350 Winter Street, NE, Room 430
Salem, Oregon 97310-3882
Phone: (503) 378-3272
Toll-free in Oregon: (800) 922-2689
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Occupational Safety and Health Office
Department of Labor and Human Resources
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Hato Rey, Puerto Rico 00918
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Fax: (787) 767-6051
Web Site: www.dtrh.gobierno.pr

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Office of OSHA Compliance
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PO Box 11329
Columbia, South Carolina 29211-1329
Phone: (803) 734-9595
Fax: (803) 734-9772
Web Site: www.llr.state.sc.us/osha.asp

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Tennessee Department of Labor and Workforce Development
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Nashville, Tennessee 37243-0659
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Fax: (615) 253-1623
Web Site: www.state.tn.us/labor-wfd/tosha.html

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Labor Commission of Utah
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Salt Lake City, Utah 84114
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Web Site: www.uosh.utah.gov/

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Occupational Safety & Health Administration
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National Life Drive
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Fax: (802) 828-2195
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Section XII

Appendices

A1. Mould FAQs

A2. Case Studies

A3. Acronyms

A4. Mould Problem Reporting Form

A5. References

A1. Mould FAQs

1. What is mould?

- Moulds are forms of fungi.
- Moulds are found everywhere – both indoors and outdoors all year round.
- Outdoors, moulds live in the soil, on plants and on dead or decaying matter.
- Mould growth is encouraged by warm and humid conditions.
- There are many thousands of species of mould and they can be in many colors, including white, orange, green, brown, or black.
- Often mould can be detected by a musty odor.
- Most fungi, including moulds, produce microscopic cells called "spores" that spread easily through the air.
- Live spores act like seeds, forming new mould growths (colonies) when they find the right conditions.
- We are exposed to fungal spores daily in the air we breathe, both outside and inside.

2. How does mould get into a building?

- Most if not all of the mould found indoors comes from outdoor sources.
- Mould spores may enter buildings and house through open doorways, windows, heating, ventilation, and air conditioning systems. Spores in the air outside also attach themselves to people and animals, making clothing, shoes, bags, and pets convenient vehicles for carrying mould indoors.
- All moulds need moisture to grow. Mould problem occurs where there is water damage, high humidity, or dampness.

- When mould spores drop on places where there is excessive moisture, such as where leakage may have occurred in roofs, pipes, walls, plant pots, or where there has been flooding, they will grow.
- Bathroom showers and steam from cooking may also create problems if not well ventilated.
- Many building materials provide suitable nutrients that encourage mould to grow. Wet paper and paper products, cardboard, ceiling tiles, wood, and wood products, are particularly conducive for the growth of some moulds. Other materials such as dust, paints, wallpaper, insulation materials, drywall, carpet, fabric and upholstery commonly support mould growth.

3. How can I prevent mould growth?

☑ CONTROL excess moisture. This is the key to preventing and stopping indoor mould growth.

KEEP susceptible areas clean and dry. Ensure good housekeeping.

VENTILATE or use exhaust fans (to the outdoors) to remove moisture from high humidity areas such as bathrooms, kitchens and laundry areas.

REPAIR water leaks promptly, and either dry out and clean or replace any water-damaged materials.

LOWER the humidity to prevent condensation problems. To lower humidity during humid weather, air conditioners and dehumidifiers may be used.

INSULATE exterior walls to prevent condensation inside during cold weather since condensation causes mould growth.

MAINTAIN HVAC system regularly.

4. What is "black mould"?

- The news media often refer to "black mould" or "toxic black mould." It has usually been associated with the mould *Stachybotrys chartarum*, a type of greenish-black mould commonly associated with heavy water damage.
- Known health effects are similar to other common moulds. It has been inconclusively associated with more severe health effects in some people.
- Not all black moulds are *Stachybotrys*.

5. Why are we concerned about mould?

- If mould is disturbed the mould spores can become airborne and be breathed in with air.
- Most people will have no reaction at all when exposed to moulds.
- Mould spore exposure can cause adverse health effects in some sensitive people.
- Some people are sensitive to moulds. Such people may experience nasal stuffiness, eye irritation, or wheezing when exposed to moulds.
- Some people may have more severe reactions to airborne mould spores. Severe reactions may occur among workers exposed to large amounts of moulds in occupational settings, such as farmers working around mouldy hay. Severe reactions may include fever and shortness of breath.
- People with chronic illnesses, such as asthma or obstructive lung disease, may develop mould infections in their lungs.
- Allergic reactions, similar to common pollen or animal allergies, are the most common health effects for individuals sensitive to moulds. Flu-like symptoms and skin rash may occur.

- Fungal infections from building-associated moulds may occur in people with serious immune disease but this is very rare. Most symptoms are temporary and eliminated by correcting the mould problem.

6. Who is more likely to develop health effects from exposure to mould?

For those who are affected by mould exposure, symptoms vary widely. People who may be affected more severely and quickly than others include:

a. infants and children;

b. elderly people;

c. pregnant women;

d. individuals with respiratory conditions or allergies and asthma; and

e. persons with weakened immune systems (for example, people with HIV infection, chemotherapy patients, or organ or bone marrow transplant recipients, autoimmune diseases).

Those with special health conditions should consult their doctor if they are concerned about mould exposure. The symptoms that may seem to occur if from mould exposure can also be due to other causes such as bacterial or viral infections, or other allergies.

7. What should I do if I see or smell mould?

☑ IDENTIFY and FIX the moisture sources that caused the mould growth.

USE bleach, detergent and water to carefully wash mould off hard surfaces and dry completely.

REPLACE porous or absorbent materials (such as ceiling tiles, wallboard and carpeting) that become mouldy. If you do not see mould growth, but notice a musty odor, mould may be growing behind water-damaged materials, such as walls, carpeting or wallpaper.

☒ DO NOT DISTURB and RELEASE mould spores into the air.

Persons cleaning mould should wear gloves, eye protection and a dust mask or respirator to protect against breathing airborne spores (a N95 dust mask or respirator may be purchased in hardware stores). If you have health concerns, you should consult your doctor before doing any mould clean up.

8. How should I identify the presence of mould?

☑ INSPECT and look for any evidence of water damage and any visible mould growth. If you notice a mould problem, get rid of the mould and solve the moisture problem.

CONDUCT an employee health survey to gather information on the types of health problems that are experienced by building occupants. Review the survey results to see if there is a possible link between health problems and symptoms known to be associated with mould exposure.

9. How do you keep mould out of buildings?

Buildings should be inspected for evidence of water damage and visible mould. The conditions causing mould (such as water leaks, condensation, infiltration or flooding) should be corrected to prevent mould from growing.

Specific Recommendations include:

☑ KEEP humidity level between 25–60%.

USE an air conditioner or a dehumidifier during humid months.

BE SURE the home has adequate ventilation, including exhaust fans in kitchen and bathrooms.

CLEAN bathroom with mould-killing products.

REMOVE and REPLACE flooded carpets.

10. I found mould growing in my workplace. How do I make sure it is not a harmful species?

Mould does not affect all exposed people equally. Some people are sensitive to mould exposure.

If you are susceptible to mould, arrange for its removal as soon as you notice signs of mould growth.

11. How do I make sure that a mould removal consultant is qualified to do the job?

Before you hire someone to perform tests ask him/her to :

- establish criteria for interpreting the test results;
- explain how he/she will determine an unacceptable mould level;
- establish a basis for making recommendations based on the sampling results;
- outline what actions you may have to take based on these recommendations;
- demonstrate previous experience; and
- show proof of membership in an accredited organization or professional group dealing with indoor air quality.

A2. Case Studies

Some cases where mould has clearly been identified as causing problems are described in the following pages.

Following are case studies of mould problems:

1. Water-damaged office building.
2. Poorly designed and constructed court house.
3. Museum work.
4. Postoperative patient illness and death.
5. Agricultural work.
6. Building demolition and remediation.

Case Study 1 – Water-Damaged Office Building

Health symptoms

For several years employees reported upper and lower respiratory tract symptoms including:

- infections,
- fatigue,
- headache, and
- depression and difficulty concentrating.

All of the above symptoms are non-specific and can have a variety of causes both environmental and social. However, since the complaints had been on-going for a number of years, a health and safety professional was consulted.

Investigative Findings.

A survey of the building found evidence of mould in areas with extensive past water damage due to:

- blocked roof scuppers resulting in standing water on the roof and leakage into the building walls, and
- inadequate drainage at the foundation.

In addition, mould odours were detected in several areas.

Further investigation into the baseboard where there was past evidence of water damage revealed fungal growth which tested positive for a kind of mould known to cause adverse health effects, *Stachybotrys chartrum*.

More extensive investigation found significant mould contamination on other floors of the building. Mould contamination was located on:

- window sills;
- carpeting;
- the drip pan of the heating ventilation;
- air conditioning unit; and
- in the filters on return air ducts.

The concentrations of mould found were very high and were consistent with mould reproduction growth and dispersion within the building.

Case Study 2 – Poorly Designed and Constructed Court House

Health Symptoms

Since moving into a new court house, employees reported these complaints:

- throat irritation,
- fatigue,
- headaches, and
- chest tightness.

Again, these symptoms are non-specific and could have a variety of causes but were unusual in that they persisted over a three-to-five year period.

Investigative Findings

A survey of the building observed moisture problems including:

- Window and roof leaks.
- Mechanical system design.
- Building construction and operational strategies leading to high humidity level.

There was clear evidence of moisture damage within the building and sampling and measurements detected the species *Stachybotrys chartrum*, *Aspergillus versicolor*, and various types of *Penicillium*.

Case Study 3 – Museum Work

Health Symptoms

A single employee reported recurrent fever, general feeling of illness and chest tightness over a number of months.

Investigative Findings

The employee worked with old and frequently mouldy books stored in the poorly ventilated basement of an arts and crafts museum. Results of investigation showed elevated concentrations of airborne spores as books were removed from shelves. The major mould found was *Aspergillus versicolor* with lesser amounts of *Penicillium*.

Case Study 4 – Postoperative Patient Illness and Death

Health Symptoms

Several patients were diagnosed with lung infection after undergoing surgery. Three of the patients subsequently died. There were no common factors between them such as age, diagnosis or type of surgery. Also, they were from different parts of the hospital including the burn unit, dialysis and oncology.

Investigative Findings

In this instance the control measures implemented during a construction phase had not taken into account the air handling systems. Air handling systems were not blocked off or shut down and transferred mould spores from the construction site to various units around the hospital resulting in the infections.

Case Study 5 – Agricultural Work

Health Symptoms

Several farm workers working in a grain elevator storage and distribution operation reported:

- shortness of breath,
- fever and chills,
- dry irritating cough, and
- general feeling of illness.

This could happen either quickly or over a period of time.

Workplace survey

The workers were often involved in cleaning up grain spills or in loading bulk grain into transport vehicles. They wore no dust masks or other protective equipment. Some of the grain had become damp through outside storage and wet weather and had undergone drying and self-heating while in the grain elevator.

Investigative Findings

Analysis of airborne moulds found various species of *Aspergillus* at high levels in and around the working area. The health symptoms experienced by the agricultural workers were attributed to inhaling the airborne mould. The disease is sometimes called "Farmer's Lung."

Case Study 6 – Building Demolition and Remediation

Health Symptoms

Construction and remediation workers were cleaning up and renovating older buildings. These buildings had been left vacant for years. After five to eighteen days of working on the site, workers complained of a number of symptoms including:

- fever,
- cough,
- exhaustion, and
- chest pain.

Upon physical examination, workers were reported to have:

- enlargement of the liver and spleen,
- anemia,
- hepatitis,
- pneumonia,
- inflammation of the lining of the heart cavity,
- meningitis, and
- ulcers of the mouth, tongue, nose and larynx.

Workplace survey

An investigation of the work site revealed extensive contamination with pigeon droppings in areas being cleared by the construction workers. The workers wore no respiratory protection.

Investigative Findings

Workers developed a condition called Histoplasmosis. It is an infectious disease of the lungs caused by a mould known as *Histoplasma capsulatum*. Laboratory tests identified the mould in the sputum.

A3. Acronyms

ACGIH
American Conference of Governmental Industrial Hygienists

ASHRAE
American Society of Heating, Refrigerating and Air-Conditioning Engineers

BRI
Building related illness

HVAC
Heating, ventilation and air conditioning

IAQ
Indoor air quality

OSHA
United States Occupational Safety and Health Administration

PEL
Permissible exposure limit

ppm
Parts per million

REL
Recommended exposure limit

TLV®
Threshold limit values. Published annually by the American Conference of Governmental Industrial Hygienists (ACGIH).

A4. Mould Problem Reporting Form

Sample

MOULD PROBLEM REPORTING FORM

Date: _____ Time: _____

Location: _____ Department: _____

Reported by: _____

State the concern: _____

Investigation Report: _____

Response: _____

Remedial Action:

1. _____
2. _____
3. _____
4. _____
5. _____

By: _____ Date & Time: _____

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Notes

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